

**Amendment 91-220****Small Airplane Airworthiness Review Program Amendment No. 5****Adopted: October 22, 1990****Effective: November 26, 1990****(Published in 55 FR 43306, October 26, 1990)**

**SUMMARY:** This final rule amends the airworthiness standards for equipment, systems, and installations and establishes airworthiness standards for the installation of electronic display instrument systems in normal, utility, acrobatic, and commuter category airplanes. It also provides alternative airworthiness standards for the instrument configuration for general, air taxi and commercial operations. This amendment updates the airworthiness and operating requirements to reflect advanced technology being incorporated in current designs while maintaining an acceptable level of safety.

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**SUPPLEMENTARY INFORMATION:***Background*

This amendment is based on Notice of Proposed Rulemaking, Notice No. 89-6, published on March 6, 1989 (54 FR 9338). All comments received in response to Notice No. 89-6 have been considered in adopting this amendment.

*Related Activity*

The FAA announced its Small Airplane Airworthiness Review Program in Notice No. CE-83-1 (48 FR 4290, January 31, 1983) and invited all interested persons to submit proposals for consideration. The goal of the review program was to provide an opportunity for the public to participate in improving, updating, and developing the airworthiness standards applicable to small airplanes, as set forth in part 23 of the Federal Aviation Regulations (FAR). Where applicable, the review program was extended to the new commuter category requirements because that commuter category incorporated existing small airplane requirements, as set forth in Amendment 23-34 (52 FR 1806, January 15, 1987).

In Notice No. CE-83-1A, (48 FR 26623, June 9, 1983), the FAA extended the period for submission of review proposals, invited by Notice No. CE-83-1, to May 3, 1984. Approximately 560 proposals were received in response to Notices No. CE-83-1 and CE-83-1A.

Following receipt of the proposals, the FAA published Notice No. CE-84-1 (49 FR 30053, July 25, 1984) containing the availability of agenda, compilation of proposals, and announcement of the Small Airplane Airworthiness Review Program Conference. That conference was held October 22-26, 1984, in St. Louis, Missouri. A copy of the transcript of all discussions held during the conference is filed in FAA Regulatory Docket No. 23494.

After reviewing the proposals and the public comments received at the conference, the FAA's first related rulemaking action concentrated on updating safety standards related to cabin safety and improved crashworthiness. On December 12, 1986, the FAA published Notice No. 86-19, titled, "Small Airplane Airworthiness Review Notice No. 1" (51 FR 44878). Notice No. 86-19 proposed to upgrade the standards for cabin safety and occupant protection during emergency landing conditions, which included dynamic testing requirements for the seat/restraint systems of small airplanes. The proposals from Notice No. 86-19 were adopted in Amendment 23-36 (53 FR 30802, August 15, 1988).

From the Small Airplane Airworthiness Review Program, Notices No. 2 and 5 were published in the FEDERAL REGISTER as Notices No. 89-5 and 89-6, respectively. These two notices, No. 89-5 and 89-6, were published March 6, 1989 (54 FR 9276 and 54 FR 9338). Action on Notice No. 89-5 will be accomplished in a separate final rulemaking document. This final rulemaking action, resulting from Notice No. 89-6, has been prepared with the consideration of all comments received on that notice.

The proposals to amend §§ 91.205 and 135.159 are the result of the petitions for rulemaking action that the FAA has received and were not specifically discussed at the Small Airplane Airworthiness Review Conference. These proposals are related to the proposals for §§ 23.1309, 23.1311, and 23.1321, therefore, this notice was expanded to include these proposals.

### *Discussion of Comments*

#### **General**

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before July 5, 1989. Five commenters responded to Notice No. 89-6. Minor technical and editorial changes have been made to the proposed rules based on both relevant comments received and further review by the FAA. Two of these commenters strongly support the adoption of these proposals.

One commenter believes that ongoing rulemaking actions have resulted in a continuing increase in the cost and complexity of certification requirements for general aviation airplanes. This commenter cites, as an example of this increased cost, the "dynamic testing of an airplane to prove it will meet the new certification requirements," and states that "For a small airplane, this test would mean the destruction of a minimum of 3 to 9 fuselages costing a total of from one to two million dollars." Consequently, this commenter expresses support for the primary category rulemaking (54 FR 9738, March 7, 1989) and urges expeditious adoption of that rulemaking action.

Proposals in this rulemaking action respond to changes in design technology that were not envisioned in the current airworthiness standards and provide an acceptable level of safety for that new technology. Any additional airplane costs that may occur from these proposed new requirements are the result of an airplane manufacturer's selection of the technology for a new airplane design. In regard to the commenter's example of dynamic testing requirements that would require the destruction of several fuselages, the FAA has not been able to identify dynamic requirements that would require destruction of a single fuselage. The FAA believes that this comment refers to the recently adopted dynamic seat testing requirements of Amendment 23-36. The new seat design and dynamic testing needed to establish compliance may exceed the cost of the seat design and static test needed to show compliance with older requirements; however, the net benefits to be realized from the reduction in occupant fatalities and injuries are expected to exceed the increase in cost. Finally, this commenter's recommendation on the expeditious adoption of the proposed primary category aircraft rule is beyond the scope of this notice.

*Discussion of Comments to Specific Sections of parts 23, 91, and 135.* The following comments and discussion are keyed to like-numbered proposals in Notice No. 89-6.

*Proposals 1, 5, 7.* These proposals contain the authority citations for parts 23, 91, and 135. No comments were received on these proposals.

*Proposal 2.* This proposal would retain the existing reliability requirements of current § 23.1309 for airplane equipment, systems, and installations that are not complex and do not perform safety-critical functions. For those cases where the applicant finds it necessary or desirable to include complex, safety-critical systems, this proposal also would provide additional requirements for identifying such equipment, systems, and installations and would define additional requirements needed for their certification. This proposal would permit the approval of more advanced systems having the capability to perform critical functions and whose failure condition would prevent the continued safe flight and landing of the airplane.

Two commenters offer comments on proposed § 23.1309. One of these commenters concurs with the concept of updating the reliability requirements applicable to airplanes not limited to Visual Flight Rules (VFR) flight, but does not concur with this updating for all airplanes. As discussed in Notice No. 89-6, this proposal addresses the systems installed on airplanes and is not limited to the operations approval of the airplane. The airworthiness standards, as adopted in § 23.1309(a), are based on single-fault or fail-safe concepts and experience based on service-proven designs and engineering judgment. These requirements should be used for airplanes whose systems are not complex and do not perform safety-critical functions. Therefore, § 23.1309(a) is structured to allow the use of existing procedures for simple airplane system designs.

If the design of the airplane includes equipment, systems, and installations that perform functions whose failure condition would prevent continued safe flight and landing of the airplane, the occurrence of such failure conditions must be extremely improbable. In addition, on airplanes designed for any type of operation not limited to VFR, the systems whose failure conditions would significantly reduce the airplane's capability, or the ability of the crew, to cope with the adverse operating conditions must be improbable. It was recognized that any failure would reduce the airplane's or crew's capability by some degree, but that reduction may not be of the degree that would make operation of the airplane potentially catastrophic. The intent of § 23.1309(b) is to require that systems whose failure would be catastrophic or potentially catastrophic be evaluated using the latest available analysis techniques.

Although future airplane designs limited to VFR operations are not likely to include equipment, systems, and installations whose failure condition would prevent continued safe flight and landing of the airplane, the applicability of this requirement, as discussed above, will provide airworthiness standards if the applicant elects to include such systems in the airplane's design. Therefore, the applicability of this requirement has not been revised as suggested by this commenter.

One commenter suggests that the critical environmental system considered in § 23.1309(c) would be better defined by removing the words "such as" from the proposed paragraph and replacing them with the word "including." The FAA agrees that the suggested wording more accurately identifies the intent of this paragraph, as discussed in the notice. The wording of paragraph (e) of § 23.1309 has been revised accordingly.

This same commenter notes that there are proposals being considered for new §§ 25.1315 and 25.1317, which deal with the effects of lightning and external high energy radiated electromagnetic fields, and suggests that similar actions be considered for part 23 rules. Although this comment is beyond the scope of the actions proposed in Notice No. 89-6, the FAA recognizes the desirability of having the various airworthiness standards address like requirements in the respective sections and will consider this comment in future rulemaking actions.

*Proposal 3.* This proposal adds a new § 23.1311 to provide the requirements for the installation of an electronic display instrument system. It provides a separate section to address the airworthiness standards for those indicators. A significant number of electronic display systems have been approved for installation in part 23 airplanes by means of special conditions.

One commenter asks if the wording of proposed § 23.1311(c), concerning electronic display indicators with features that make isolation and independence between powerplant instrument systems impractical, will be supported by an appropriate amendment to require such isolation. As discussed in Notice No. 89-6, the current requirements of part 23 address powerplant instruments that could provide the required data only by using individual instruments. Accordingly, the isolation and independence referred to in § 23.1311(c) are currently required in § 23.903(c). The objective of this regulation is to allow the use of electronic display indicators that will not provide the isolation and independence considered in the current requirements. The FAA is not considering an additional amendment to address this issue.

*Proposal 4.* This proposal would revise § 23.1321 to provide that flight instruments to be used by any required pilot be located so that only minimal eye and head movement are needed to monitor the airplane's flight path and these instruments. This proposal would also extend the T-arrangement of the flight instruments to all airplanes that are certificated for flight under instrument flight rules (IFR) and would provide for electronic display indicators to be located in this T-arrangement. No comments were received on this proposal and it is adopted as proposed.

*Proposal 6.* This proposal would revise § 91.205 to permit the operation of all airplanes with the installation of a third attitude instrument system instead of the gyroscopic rate-of-turn indicator, providing that the instrument and installation comply with the requirements of § 121.305(j). [Part 91 was reorganized and its sections renumbered (54 FR 34284, August 18, 1989). The original proposal would have revised § 91.33, but that section is renumbered as § 91.205.] No comments were received on this proposal and it is adopted as proposed.

*Proposal 8.* This proposal would revise § 135.149 to establish uniformity in installation requirements when a third attitude instrument system is installed. No comments were received on this proposal and it is adopted as proposed.

*Proposal 9.* This proposal would revise § 135.159 to permit part 135 operation of any airplane, with the installation of a third attitude instrument system instead of a gyroscopic rate-of-turn indicator, that is substantially the same as airplanes, similarly equipped, that are permitted in part 121 operation. No comments were received on this proposal and it is adopted as proposed.

## Regulatory Evaluation Summary

### *Introduction*

This section summarizes the full regulatory evaluation prepared by the FAA that provides more detailed estimates of the economic consequences of this regulatory action. This summary and the full evaluation quantify, to the extent practicable, estimated costs to the private sector, consumers, Federal, State, and local governments, as well as anticipated benefits.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if potential benefits to society for each regulatory change outweigh potential costs. The order also requires the preparation of a Regulatory Impact Analysis of all "major" rules except those responding to emergency situations or other narrowly defined exigencies. A "major" rule is one that is likely to result in an annual increase in consumer costs, a significant adverse effect on the economy of \$100 million or more, a major increase in consumer costs, a significant adverse effect on competition, or is highly controversial.

The FAA has determined that this rule is not "major" as defined in the executive order; therefore, a full regulatory analysis, which includes the identification and evaluation of cost-reducing alternatives to this rule, has not been prepared. Instead, the agency has prepared a more concise document, termed a "regulatory evaluation", that analyzes only this rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains the regulatory flexibility determination required by the Regulatory Flexibility Act and an International Trade Impact assessment. If more detailed economic information is desired, the reader may refer to the full regulatory evaluation contained in the docket.

### *Economic Evaluation*

This regulatory evaluation examines the effect of a final rule to amend parts 23, 91, and 135. The amendments to parts 91 and 135 contained in this rule allow the installation of a third attitude indicator instead of the currently required rate-of-turn indicator. Flight instrument systems now being proposed for installation need not include the rate-of-turn function. Allowing an additional attitude indicator with a dedicated power supply relieves the burden on the manufacturer and allows safer operations because of the greater utility of third attitude indicators.

The amendments to parts 91 and 135 impose no cost on the aviation community or other persons, but rather, include provisions for an alternative.

The amendments to part 23 contained in this rule upgrade airworthiness standards to include design requirements for complex systems critical for safety in small airplanes. These upgraded standards, which are based on proposals submitted at the Small Airplane Airworthiness Review Conference in St. Louis, apply only to aircraft for which an application for a type certificate under part 23 is made after the effective date of this rule. The amendments require examination of systems and equipment for their criticality to continued safe flight and landing of the airplane, require reliability of such systems based on their criticality and set forth standards for installation of instrument systems utilizing electronic display indicators.

Current computer and instrumentation technology has resulted in systems and equipment being available for small airplanes that are novel and unusual relative to what was envisioned and considered when the previous part 23 requirements were promulgated. Therefore, the FAA found it necessary to issue special conditions and expend significant resources to assure adequate airworthiness standards for these systems.

The amendments to part 23 are cost-relieving because they eliminate the need for special conditions processing, which often involves costly and unnecessary delays. In addition, these amendments are optional in the sense that the manufacturers are not being directed to incorporate the newest technology in their future models, but instead are being afforded a set of regulations to observe should they choose the new equipment.

Furthermore, it was concluded that an undetermined measure of safety benefits could be attributed to the three amendments to part 23. These benefits are based on: (1) the reduction in accidents that might otherwise occur under the "single fault" or "fail safe" analysis of failure potential for both complex, safety critical systems and multi-function electronic instrument displays, and (2) the reduction in accidents that could be afforded by the use of these advanced systems and displays.

The gross value of these benefits was estimated to range between \$2.14 million and \$2.46 million, depending on the assumptions concerning equipage rates and accident reduction effectiveness. However, it should be noted that this estimate measures the isolated effect on the regulatory amendments in and of themselves. Future airplane designs with advanced systems and instrument displays could be evaluated without these amendments through the special conditions process of § 21.16. Therefore, only a portion of the gross safety benefit estimate actually will be realized. The net benefit would be determined by the extent to which these amendments, as compared to the special conditions procedures, expedite the development of airplanes that employ advanced systems and instrument displays and improve the analysis of their safety and reliability.

#### *International Trade Impact Analysis*

The provisions of this rule will have little or no impact on trade for both U.S. firms doing business in foreign countries and foreign firms doing business in the United States. In the United States, foreign manufacturers would have to meet U.S. requirements, and, thus, they would gain no competitive advantage. In foreign countries, U.S. manufacturers would not be bound by part 23 requirements and could, therefore, implement the provisions of the rule solely on the basis of competitive considerations.

#### *Regulatory Flexibility Determination*

The FAA has determined that the rule changes will not have a significant economic impact on a substantial number of small entities. The FAA's criteria for a small airplane manufacturer is one with fewer than 75 employees. A substantial number is a number that is not fewer than 11 and that is more than one-third of the small entities subject to the rule.

A review of domestic general aviation manufacturing companies indicates that only two companies meet the size threshold of 75 employees or fewer. Therefore, the amendments to parts 23, 91, and 135 will not affect a substantial number of small entities.

#### *Federalism Implications*

The regulations adopted herein will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

#### *Conclusion*

This document amends the airworthiness standards for complex safety, related critical systems and the installation of electronic display systems. These standards provide design options to the manufacturer that are not available under existing regulations. This document concerns rules that do not impose a burden, but merely afford an alternative, and they will not result in an annual increase in consumer costs or have an adverse effect on the economy. The FAA has determined that this amendment is not major as defined in Executive Order 12291. For the same reason, this amendment is not considered to be significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). Since there are no small entities affected by this rulemaking, it is certified, under the criteria of the Regulatory Flexibility Act, that this amendment will not have a significant economic impact, positive or negative, on a substantial number of small entities. In addition, these final rules will have little or no impact on trade opportunities for U.S. firms

doing business overseas or for foreign firms doing business in the United States. A copy of the regulatory evaluation prepared for this project may be examined in the Rules Docket or obtained from the person identified under the caption "FOR FURTHER INFORMATION CONTACT."

#### THE AMENDMENT

In consideration of the foregoing, the Federal Aviation Administration amends parts 23, 91 and 135 of the Federal Aviation Regulations (14 CFR parts 23, 91 and 135) effective November 26, 1990.

The authority citation for part 91 continues to read as follows:

*Authority:* 49 U.S.C. 1301(7), 1303, 1344, 1348, 1352 through 1355, 1401, 1421 through 1431, 1471, 1472, 1502, 1510, 1522, and 2121 through 2125; Articles 12, 29, 31, and 32(a) of the Convention on International Civil Aviation (61 Stat. 1180); 42 U.S.C. 4321 *et seq.*; E.O. 11514; 49 U.S.C. 106(g).

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